



INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior
National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)
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Reporting Year: 2009	Park: Shenandoah NP	Select the type of permit this report addresses: Scientific Study	
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Project Title (maximum 300 characters): Modeling and Restoration of American Butternut in Eastern Parks			
Park-assigned Study or Activity #: SHEN-00365	Park-assigned Permit #: SHEN-2009-SCI-0018	Permit Start Date: Oct 01, 2009	Permit Expiration Date: Dec 31, 2009
Scientific Study Starting Date: Apr 22, 2009		Estimated Scientific Study Ending Date: Dec 31, 2009	
For either a Scientific Study or a Science Education Activity, the status is: Completed		For a Scientific Study that is completed, please check each of the following that applies: <input checked="" type="checkbox"/> A final report has been provided to the park or will be provided to the park within the next two years <input type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park <input type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: Research			
Subject/Discipline: Plant Communities (Vegetation)			

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

Butternut, or white walnut (*Juglans cinerea*), is a medium-sized hardwood species native to the eastern forests of North America. The species is utilized for veneer and lumber and is an important producer of hard mast for wildlife. Additionally, the nuts are palatable for human consumption, and cultivars have been selected for orchard production.

Throughout the range of the species, butternut populations are experiencing severe declines due to an exotic fungus, *Sirococcus clavigignenti-juglandacearum*. The disease was first discovered in 1967 in southwestern Wisconsin, but is believed to have originated on the southeastern coast as much as 70 years ago. Butternut canker disease has infected populations throughout most of the species range, with the greatest impacts on southern populations. The progression of the disease begins with black lesions, or cankers, forming on the branches of trees, which are then spread by rain and wind to the boles. The main stem and branch cankers result in poor crown conditions with increasing disease severity; tree mortality is caused by eventual girdling of the bole. Forest Inventory and Analysis data indicate the disease has eliminated close to 80 percent of the butternut trees over a 30 year period in some southeastern states.

The rapid decimation of butternut populations has been considered so severe that the status of the species was reviewed by the U.S. Fish and Wildlife Service and harvesting of butternut on Forest Service lands has been restricted since 1993. Currently, the species is listed as a Federal species of concern and is recognized by the Detection Monitoring component of Forest Health Monitoring. To date, there has been no proven strategy for protecting butternut trees from the disease or returning resistant butternut trees to eastern forests. However, a survey for surviving butternut trees in the southern Appalachians has revealed clumped groups of trees that show no or extremely limited signs of infection by the disease and trees that are recovering from the disease (healing cankers). The survival of these trees in areas with massive die-off and in close proximity to dead and dying trees suggests the possibility of resistance or a debilitated fungus. If host resistance is present, then a backcross breeding approach could be a feasible strategy for producing resistant butternut trees. The success of a breeding program for restoration, however, is predicated by the ability to transfer resistance, the existence of a broad-based germplasm, and a thorough understanding of species site requirements. For National Park areas, restoration of local genotypes will be desirable because of NPS policies regarding introducing exotic germplasm. The first steps in this process is to locate trees and assess their overall health. Therefore, our objectives are as follows:

1. Compile a database of butternut locations within selected Shenandoah National Park and assess health of butternut trees using the Forest Health Monitoring (FHM) crown condition classification system.
2. Develop and test (field validation) a GIS-based predictive model to determine habitat characteristics of butternut within the Park.
3. If disease is present, conduct multivariate analyses to determine if disease severity is associated with specific landscape conditions.
4. Delineate potential restoration sites using knowledge of butternut habitat requirements and conditions unfavorable for the fungal pathogen, if any exist.

Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

Modeling statistics and specifics have been developed throughout 2009. Additional Butternut locations and conditions were collected in 2009. The modeling effort is in its final stages and should be completed in 2010. This was an extension of the original permit to cover the additional sampling done this year.

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?

No

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):
\$10000

Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):
\$0

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:

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to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.